

**COLORADO LAGOON  
WATERSHED IMPACTS REPORT**

**CITY OF LONG BEACH**

**COLORADO LAGOON RESTORATION  
FEASIBILITY STUDY**

**July 30, 2004**

**Prepared by**



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## **EXECUTIVE SUMMARY**

The Colorado Lagoon watershed (identified as Basin 21 by the City of Long Beach Storm Water Management Program) lies entirely within the boundaries of the City of Long Beach. The watershed is approximately 1,172 acres; consisting of 773 acres residential, 125 commercial, 55 acres institutional, and 219 acres of open space. The available open space is parks and golf courses. The watershed does not support space for new development, redevelopment of existing occurs intermittently throughout.

The watershed is broken into five sub-basins that discharge storm water and urban dry weather runoff to the Colorado Lagoon. Each of the sub-basins are served by a major storm sewer trunkline and supporting appurtenances that collect and transport storm water and urban dry weather runoff to the Colorado Lagoon. Surface water runoff within the watershed occurs as overland runoff into curb inlets and catch basins, and as sheet flow from near shore areas.

Potential contaminants that can be found in the watershed include sediment, phosphorous, metals, pesticides and herbicides, and pathogens. Due to the fact that the watershed is mainly impervious, contaminants are transported quickly to the storm drain system during rain events, and carried to the lagoon during the “first flush.” The amount of days between rainfall events, and the placement and implementation of best management practices (BMP) can significantly impact the amount of contaminants that reaching the lagoon.

The City of Long Beach has developed a Storm Water Management Program, as required by National Pollutant Discharge Elimination System (NPDES) Permit No. 99-060, and the Los Angeles Regional Water Quality Control Board, to control the discharge of pollutants to the storm drain system. The City has identified specific activities that require BMP development and implementation for facilities and operations known to contribute contaminants to the watershed.

Overall the Colorado Lagoon watershed water quality conditions are generally very good. The overall potential for contamination from the commercial and residential activities within the watershed is minor. There are some activities that need further BMP development and/or enforcement to further reduce the potential for contamination of the Colorado Lagoon. These activities in order of priority, are as follows:

- Construction Activities – improve sediment capture
- Commercial Parking Area Wash Down – educate and/or enforce
- Over-Watering – educate and/or enforce
- Pesticide/Herbicide Use – educate, require management plans, enforce
- Pathogens – education

The potential for contamination by each of these activities can be mitigated through education, source control, and/or enforcement. End of pipe treatment and/or diversion to the sanitary sewer does not at this time appear practical based on available information and field investigations.

## **PROJECT BACKGROUND**

The Colorado Lagoon Watershed Impacts Report is a working document developed for four reasons:

1. To present the current state of the watershed.
2. Identify areas of specific concern and where more data are needed.
3. Describe activities underway within the watershed that protect water quality.
4. Foster greater awareness and understanding about the watershed.

This report is the first phase of the Colorado Lagoon Restoration Feasibility Study. The purpose of the study is evaluate and recommend feasible opportunities to restore the marine ecosystem and support safe recreation while improving water and sediment quality, and managing storm water into Colorado Lagoon.

## **GENERAL DESCRIPTION OF WATERSHED**

The Colorado Lagoon watershed lies entirely within the boundaries of the City of Long Beach. The watershed is dominated by single family residential units with a number of multi-family units interspersed throughout. Many factors enter into the type of pollutants, source of pollutants, and overall water quantity and quality of the Colorado Lagoon watershed. These include natural factors such as climate, topography, geology, soils, water resources, vegetation in open spaces, and wildlife adjacent to the Lagoon. There are also human factors affecting the watershed such as land use, demographics, economic development, and recreation. The state and sustainability of the watershed depends on the interrelationship between the natural and human factors. With respect to the human factor, the watershed is almost entirely built out. Remaining open space includes the City of Long Beach Recreation Park Area, consisting of two golf courses and adjacent park areas, the Pacific Electric right-of-way greenbelt, and to a lesser degree the picnic and park areas surrounding Colorado Lagoon.

### **Drainage Area Basin 21**

The Colorado Lagoon Watershed is characterized as Basin 21, as identified in the City of Long Beach Storm Water Management Program, see Map1. There are four major drainage systems that drain to the Colorado Lagoon, and one that drains directly to Marine Stadium. This report will concentrate on only those systems that drain to the Colorado Lagoon.

## Sub-Watersheds

For the purposes of this report the Colorado Lagoon Watershed has been broken into five sub-basins, see Map 2. Each sub-basin discharges to the Colorado Lagoon through individual storm drainage systems. The sub-basins are as follows:

- **Sub-basin A.** Discharges to Colorado Lagoon via a 63-inch reinforced concrete pipe discharging into the north part of the west arm. The drainage pattern is generally to the south and east. Sub-basin A contains the heaviest concentration of commercial activities mainly concentrated along Anaheim Street and the northern part of Redondo Avenue.
- **Sub-basin B.** Discharges to Colorado Lagoon via a 54-inch reinforced concrete pipe discharging into the north part of the north arm. The drainage pattern is generally to the south and west. Sub-basin B is predominately park/golf course open space with some residential in the north east corner.
- **Sub-basin C.** Discharges to Colorado Lagoon via a 48-inch reinforced concrete pipe discharging into the mid-point of the north arm. The drainage pattern is generally to the south and west. Sub-basin C is almost entirely residential with a few commercial activities at the eastern boundary.
- **Sub-basin D.** Discharges to Colorado Lagoon via a 24-inch reinforced concrete pipe discharging into the south part of the west arm. The drainage pattern is generally to the north and east. Sub-basin C is almost entirely residential with some schools and other public facilities.
- **Sub-basin E.** Discharges to Colorado Lagoon via a 48-inch reinforced concrete pipe discharging into the west arm. The drainage pattern is generally to the south and east. Sub-basin E is mainly residential with commercial activities located along 7<sup>th</sup> Street, Coronado and Redondo Avenues to the west, and public facilities to the north.

Several other smaller storm drains serve the areas immediately adjacent to the lagoon. These smaller storm drains can contribute small amounts of contaminants but are negligible to the impacts of each of the sub-basins listed above.

## Climate

Average rainfall amounts according to the National Weather Service are 12.94-inches over the last 30 years for the City of Long Beach. The rainy season normally extends from October to May. Prevailing winds are out the southwest at 6.2 miles-per-hour.

## Topography

The watershed consists of gently rolling hills from the east to west, and west to east with the Colorado Lagoon roughly at the center. The watershed ranges in elevation from 125 feet above sea level at the northwestern portion to sea level within the Colorado Lagoon. See Attachment A.

## **Soil Type**

The watershed consists of two similar types of soil series, see Attachment B:

1. Ramona Series - a member of the fine-loamy, mixed, thermic family of Typic Haploxeralfs. Typically, Ramona soils have brown, slightly and medium acid, sandy loam and fine sandy loam A horizons, reddish brown and yellowish red, slightly acid, sandy clay loam B2t horizons, and strong brown, neutral, fine sandy loam C horizons. Ramona soils dominate the watershed.
  - a. Geographic Setting. The Ramona soils are nearly level to moderately steep. They are normally on terraces and fans at elevations of 250 to 3,500 feet. They formed in alluvium derived mostly from granitic and related rock sources. The climate is dry subhumid mesothermal with warm dry summers and cool moist winters. Mean annual precipitation is 10- to 20-inches. Average January temperature is 50 degrees F., average July temperature is about 70 degrees F., average annual temperature is 60 degrees to 66 degrees F. The frost-free season is 230 to 320 days.
  - b. Drainage and Permeability. Well-drained; slow to rapid runoff; moderately slow permeability.
2. Tujunga Series - consists of very deep, somewhat excessively drained soils formed in alluvium weathered mostly from granitic sources. Tujunga soils are on alluvial fans and flood plains and have slopes of 0 to 9 percent. The mean annual precipitation is normally about 16-inches and the mean annual air temperature is about 62 degrees F. Tujunga soils are found directly adjacent to the Colorado Lagoon.
  - a. Geographic Setting. Tujunga soils occur at elevations of 5 to 4,300 feet on alluvial fans and flood plains and have slopes of 0 to 9 percent. The soils formed in sandy alluvium derived mostly from granitic sources. The climate is subhumid mesothermal with cool moist winters and hot dry summers. Mean annual precipitation is 10- to 25-inches. Mean annual temperature is 58 to 65 degrees F.; mean January temperature is 45 to 50 degrees F.; mean July temperature is 75 to 80 degrees F. Frost-free season is 225 to 350 days.
  - b. Drainage and Permeability. Somewhat excessively or excessively drained; negligible or very low runoff; rapid permeability. Flooding is none to frequent.

## **Surface Water Resources**

There are no surface water bodies within the Colorado Lagoon watershed other than the lagoon itself. During rain events stormwater runoff is directed to the lagoon through a series of pipelines and overland flow. During dry weather, runoff from activities such as lawn watering, washing down surfaces, and other illicit discharges is directed to the lagoon by the same pipelines.

## **Terrestrial Vegetation**

Native plant species have been replaced with landscaped vegetation throughout the watershed. Concentrated vegetation is restricted mainly to the park open space areas. The landscaped vegetation consists of a number of tree species including oaks, elderberry, magnolia, and a predominance of eucalyptus. Open spaces consist of groomed non-native grasses that are groomed daily on the golf courses and routinely within the park spaces. Little stormwater flow deflection occurs in these areas due to grooming. A high amount of detritus matter is carried to the Colorado Lagoon when the open spaces are over watered.

## **Land Use**

Basin 21 is 1,172 acres and is made up of 773 acres residential, 125 acres commercial, 55 acres institutional and 219 acres of open space. It is located in the south central portion of Long Beach and is bound on the north by Pacific Coast Highway, the South by Broadway, the west by Redondo/Coronado, and the east by Bellflower.

## **POTENTIAL SOURCES OF CONTAMINATION**

### **Introduction**

Pollutants are categorized in two ways for the practical operation of water pollution control. These are: 1) the manner in which pollutants enter the watershed and 2) opportunities for pollutants to be treated and removed from watershed.

Pollutants enter the Colorado Lagoon through direct, piped and channeled discharges, and are classified as point sources. Non-point sources (see Table 1) found to be the major contributors to water pollution in the Lagoon are: runoff from paved streets and parking lots, construction sites, soil erosion, pesticide/herbicide application, wash down at commercial sites, minor industrial operations such as oil well production, and atmospheric deposition of acidic and/or toxic air pollutants.

A summary of sediments found in the lagoon are reported in the Colorado Lagoon: Sediment Testing Report, July 2004.

Sediment can be both a pollutant and a vehicle for carrying other pollutants which become attached it. For example, sediments can contain phosphorus, but much of the phosphorus added to soil through the use of fertilizers can also get bound to sediment particles and transported to the lagoon. When soil and detritus is disturbed (erosion), it can be transported to the lagoon. The particles themselves may be considered a pollutant because they cause the lagoon water to become cloudy. The phosphorus in the transported sediment may later become available to aquatic plants.

Table 1 Non-Point Sources and Potential Impacts on Colorado Lagoon		
Pollutant	Associated Land Use	Potential Impacts
Sediment	Construction sites, urban runoff, erosion, landscape watering	<ul style="list-style-type: none"> <li>Decreases transmission of light, affecting plant production (food and cover), behavioral activities (nesting, feeding, mating), respiration, digestion, reproduction</li> <li>Can increase surface water temperature, which decreases dissolved oxygen concentration in water</li> <li>Decreases spawning habitat (fills lagoon and nest sites)</li> <li>Transports absorbed contaminants</li> <li>Nutrients increase, which stimulates algae growth</li> <li>Reduces flood storage</li> <li>Decreases clarity of</li> <li>Can reduce aesthetic and recreational value</li> <li>Can reduce native populations</li> </ul>
Phosphorus and Nitrogen	Urban development, fertilizers	<ul style="list-style-type: none"> <li>Promotes algae blooms, inhibiting aquatic plant growth</li> <li>Can favor survival of less desirable species over more desirable species</li> <li>Can reduce dissolved oxygen levels through increased productivity and decay of organic matter</li> <li>Can alter wetland vegetation/habitat</li> <li>Can promote eutrophication of lagoon</li> <li>Increases algae growth, which may create public health risks</li> <li>Can decrease aesthetic value</li> <li>Can degrade shellfish activities</li> </ul>
Metals	Urban development, commercial/industrial activities, illicit discharges	<ul style="list-style-type: none"> <li>Accumulates in sediments, which may pose risk to bottom feeders</li> <li>Bioaccumulates in fish tissue</li> <li>May affect reproductive rates and life spans of aquatic organisms</li> <li>Can hinder photosynthesis in aquatic plants</li> <li>May color water</li> <li>Can leave stains on fixtures</li> <li>Poses possible health hazard from toxic metals</li> </ul>
Pesticides and Herbicides	Lawn and golf course Care, urban runoff	<ul style="list-style-type: none"> <li>Accumulates in sediments, which may pose risk to bottom feeders</li> <li>Bioaccumulates in fish tissue</li> <li>May kill fish and other aquatic organisms</li> <li>Can hinder photosynthesis in aquatic plants</li> <li>Carcinogenic effects may cause public health risks</li> <li>Can adversely impact survival of wetland fauna and flora</li> <li>Can reduce waterfront property values</li> <li>May restrict clamming if contamination is found in tissue</li> </ul>



<b>Table 1 Non-Point Sources and Potential Impacts on Colorado Lagoon</b>		
<b>Pollutant</b>	<b>Associated Land Use</b>	<b>Potential Impacts</b>
Pathogens	Urban runoff, illegal discharge, pets, wildlife overpopulation	<ul style="list-style-type: none"> <li>• Can introduce disease-bearing organisms to aquatic life</li> <li>• Closes shellfish areas</li> <li>• Increases public health risks</li> <li>• May result in loss of recreation areas</li> <li>• Closes swimming areas</li> </ul>

Pollutants can be classified by various treatment technologies such as conventional, non-conventional or toxic. Conventional pollutants include organic materials that require oxygen to decompose (biodegradable), waste handling operations at restaurants fall into this category, as do oil and grease. Inorganic sediments such as sand or silt are conventional pollutants; these substances can be removed from stormwater and dry weather flows with conventional treatment. Bacteria associated with the intestinal tract of animals and humans (fecal bacteria, as indicated by the coliform group) are conventional pollutants and can be destroyed by disinfection with chlorine, ozone or ultraviolet light.

Non-conventional pollutants include excessive levels of nutrients, such as nitrogen and phosphorus, which require more advanced treatment to be removed from stormwater and dry weather flows. These substances may come from many sources, including fertilizers, atmospheric deposition, and sewage.

Toxic pollutants such as heavy metals (chromium, lead), inorganic chemicals (salts, acids), and organic chemicals (pesticides, solvents) can damage human health, aquatic organisms, and the overall health of the Colorado Lagoon. Toxic effects can be acute, causing immediate death or impairment to some organisms, or chronic, causing subtle damage that may not emerge until years after exposure. Toxics often persist in the environment, collecting either in water or in lagoon bottom sediments. Toxics can bioaccumulate in the tissues of organisms after repeated intake or exposure.

Surface water runoff within the watershed occurs as overland runoff into curb inlets and catch basins, and as sheet flow near the shores of the lagoon. The Colorado Lagoon watershed is predominately impervious surface due to urban development. The capacity of the soils and vegetation to absorb water from precipitation is minimal and occurs mainly in Sub-basin B within the confines of Recreation Park. The water-retention capacity is low and runoff from these soils is generated quickly.

Since precipitation-generated runoff is the major transport mechanism for non-point source pollution, a direct relationship exists between the timing and magnitude of precipitation events and the resulting level of non-point source pollution. Factors that affect the rate at which precipitation becomes runoff include the soil moisture conditions at the time of the precipitation event, vegetation type and density, and urbanization with its associated impervious surfaces. As most of the watershed is impervious, “first flush”,

a time when the majority of pollutants are scoured and carried downstream, occurs more rapidly. The amount of days between rainfall events experienced in the area allows greater pollutant build-up to occur. When rainfall events do occur the first flush of pollutants is rapid and normally exhibits a heavy spike in concentration discharged to the lagoon. Therefore, climatic conditions preceding the precipitation event and the timing of the event are important factors in determining the amount of precipitation that will be available for the “first flush” of the watershed. Generally, the first 30 minutes of a 0.10-inch rainfall event typically removes most of the pollutants from the watershed, but this will vary based on the intensity of the rainfall event. As the rainfall event exceeds 30 minutes, pollutant concentrations will decrease significantly.

Non-point source inputs not only occur from the runoff of precipitation, but also from precipitation falling directly onto the land surface or the lagoon. Precipitation occurs as wet deposition (wet-fall) of rain droplets, and dry deposition (dry-fall) of particulate matter. In the atmosphere, the mixture of gases, water vapor, particulate matter, and wind currents form a dynamic environment in which changes in chemical composition of precipitation can frequently occur. Precipitation can carry increasing amounts of inorganic contaminants and sediments to the lagoon. Dissolved oxides of nitrogen and sulfur are frequently found in the atmosphere, and can be carried down in precipitation as acid rain. These compounds originate from automobile exhaust and power plant emissions, as well as from other minor sources.

### **National Pollutant Discharge Elimination System (NPDES) Permit**

The City of Long Beach was issued NPDES Permit No. 99-060 on June 30<sup>th</sup>, 1999. The permit required the City to develop programs to control the discharge of pollutants and to conduct municipal maintenance activities to prevent pollutants from entering receiving waters. Several activities that cause runoff are identified in the permit as conditionally permitted to be discharged to the storm drainage system. Some of these include:

- Reclaimed and potable landscape irrigation water
- Water line flushing
- Discharges from potable water sources
- Foundation drains
- Footing Drains
- Air conditioning condensate
- Water from crawl space pumps
- Reclaimed and potable irrigation water
- Reclaimed and potable lawn watering
- De-chlorinated swimming pool discharges
- Individual residential car washing
- Sidewalk washing

It is from these conditionally exempt activities that the majority of non-stormwater flows to the Colorado Lagoon originate from. Understanding that the identified types of flow are allowed under permit no. 99-060, best management practices (BMP) have been developed to reduce the potential for pollutants coming into contact with these flows.

The City has developed the Long Beach Storm Water Management Program Manual that identifies specific programmatic BMP to reduce the potential for storm and non-stormwater flows to become contaminated. Some of the BMP programs include:

- Trash and Green Waste Control
- Code Enforcement
- Street Maintenance
- Sewage System Operations and Maintenance
- Storm Drain Systems Operations and Maintenance
- Municipal Facilities Maintenance
- Public Construction Activities
- Landscape Maintenance
- Special Events Management

**Construction Projects.** For construction projects that result in soil disturbance of one acre or more of total land area, a Storm Water Pollution Prevention Plan (SWPPP) is required to be prepared and implemented. The City of Long Beach requires that each construction project have a notice of intent filed with the State Board before issuance of a construction permit. Those projects requiring a SWPPP are also required to prepare and administer a storm water monitoring program. As the majority of the watershed is built-out, construction activities are normally associated with smaller projects. A new requirement for development of a standard urban stormwater mitigation plan (SUSMP) for new will further reduce pollutant discharges.

**Above/Below Ground Storage Tanks.** Chemical and petroleum products held in storage tanks pose a significant threat to the water quality of Colorado Lagoon. Leaking underground storage tanks can be significant sources of oil, fuel, and volatile organic compound (VOC) contamination.

In the Colorado Lagoon watershed there are a number of underground and above ground storage tanks. The underground tanks are at gasoline service stations located at Redondo and Anaheim, and at Redondo and 7<sup>th</sup>. Other above ground tanks that contain waste oil, unleaded gasoline, and diesel fuel are located at Recreation Park, and car repair facilities. During field investigations, it appeared that all abandoned or out-of-service underground storage tanks had been removed

**Hazardous Materials.** Hazardous materials are classified as substances that pose a danger to living organisms, materials, structures, or the environment by explosion or fire hazards, corrosion, toxicity to organisms, or detrimental effects. Large-scale hazardous materials use and waste storage is regulated by federal, state, and local statute, but household use of small amounts of hazardous materials is rarely adequately regulated, see Table 2 (Potentially Harmful Components of Common Household Products). Small-scale users may accidentally introduce contaminants to the Colorado Lagoon. There are many types of hazardous substances, often consisting of mixtures of more than one substance.

Table 2 Potentially Harmful Components of Common Household Products	
Product	Toxic or Hazardous Components
Antifreeze (gasoline or coolants systems)	Methanol, ethylene glycol
Automatic transmission fluid	Petroleum distillates, xylene
Battery acid (electrolyte)	Sulfuric acid
Degreasers for driveway and garages	Petroleum solvents, alcohols, glycol ether
Degreasers for engines and metal	Chlorinated hydrocarbons, tulene, phenols, dichloroperchloroethylene
Engine and radiator flushes	Petroleum solvents, ketones, butanol, glycol ether
Hydraulic fluid (brake fluid)	Hydrocarbons, fluorocarbons
Motor oils and waste oils	Hydrocarbons
Gasoline	Hydrocarbons
Diesel fuel, kerosene, #2 heating oil	Hydrocarbons
Grease, lubes	Hydrocarbons
Rustproofers	Phenols, heavy metals
Car wash detergents	Alkyl benzene sulfonates
Car waxes and polishes	Petroleum distillates, hydrocarbons
Asphalt and roofing tar	Hydrocarbons
Paints, varnishes, stains, dyes	Heavy metals, toluene
Paint and lacquer thinner	Acetone, benzene, toluene, butyl acetate, methyl ketones
Paint and varnish removers, deglossers	Methylene chloride, toluene, acetone, xylene, ethanol, benzene, methanol
Paint brush cleaners	Hydrocarbons, toluene, acetone, methanol, glycol ethers, methyl ethyl ketones
Floor and furniture strippers	Xylene
Metal polishes	Petroleum distillates, isopropanol, petroleum naphtha
Laundry soil and stain removers	Hydrocarbons, benzene, trichloroethylene, 1,1,1-trichloroethane
Other solvents	Acetone, benzene
Refrigerants	1,1,2-trichloro-1,2,2-trifluoroethane
Bug and tar removers	Xylene, petroleum distillates
Household cleaners, oven cleaners	Xylenols, glycol ethers, isopropanol
Toilet cleaners	Drain cleaners 1,1,1-trichloroethane
Disinfectants	Xylene, sulfonates, chlorinated phenols
Pesticides (all types)	Cresol, xylenols
Photochemicals	Naphthalene, phosphorus, xylene, chloroform, heavy metals, chlorinated hydrocarbons
Printing ink	Phenols, sodium sulfite, cyanide, silver halide, potassium bromide
Wood preservatives (creosote)	Heavy metals, phenol-formaldehyde
Swimming pool chlorine	Penachlorophenols
Lye or caustic soda	Sodium hypochlorite
Jewelry cleaners	Sodium hydroxide
	Sodium cyanide
Source: Natural Resources Facts: Household Hazardous Wastes, Fact Sheet No. 88-3	

**Hazardous Spills.** Hazardous spills can occur in a number of ways including leaking underground storage tanks, materials transfer, and materials transport. Improper

chemical storage, insufficient materials handling, and poor quality containers can be major threats to the Colorado Lagoon watershed. Tanker trucks pose another chemical storage hazard.

The Long Beach Storm Water Management Program Manual specifies that procedures are in place to contain, clean up, and investigate spills and illicit discharges. These include procedures for sewage spills and hazardous materials discharges/spills. City departments follow their respective policies and procedures for their department response. It is unlikely that a major chemical spill will occur in the watershed due to the very low number of commercial businesses storing chemicals or petroleum.

**Industrial Sources.** There are very limited industrial sources within the Colorado Lagoon watershed. Industrial sources of contamination are limited to industrial pipeline and well drilling operations.

Oil wells including operating and abandoned production and exploratory wells and dry wells are limited. Production wells can be found next to the Recreation Park Golf Course Maintenance area. These wells can include the following contaminants: petroleum, brine (sulfates and chloride), metals, acids, minerals, sulfides, and other hazardous and non-hazardous chemicals. Leaky production wells can allow oil to enter waterways from the surface. Often wells are not properly capped, which can allow pollution from surface runoff to Colorado Lagoon.

**Commercial Sources.** NPDES Permit No. 99-060 identifies Phase I commercial sources as industrial facilities, vehicle repair shops, vehicle body shops, vehicle parts (excluding parts retail stores with no outside storage) and accessory facilities, gas stations, restaurants, and additional industrial/ commercial facilities identified as priorities by the Regional Board Executive Officer or the City of Long Beach.

General commercial sources include “low risk” commercial, office building/institutional, and schools and government offices. The areas of general commercial sources can be seen on Map 3. Commercial sources are concentrated along Redondo Ave., 7<sup>th</sup> Street, Anaheim Street, Bellflower Blvd., Pacific Coast Highway, and to a lesser degree along 10<sup>th</sup> Street. They are dispersed mainly to the west and north of the watershed. These general commercial sources are mainly retail establishments that may have potential contaminants in inventory but are not exposed to rainfall. Specific Commercial Sources include the following potential sources of contamination categories:

- ***Auto repair shops.*** Include waste oils, solvents, acids, paints, automotive wastes (gasoline, antifreeze, automatic transmission fluid, battery acid, engine and radiator flushes, engine and metal degreasers, hydraulic (brake) fluid and motor oils), and miscellaneous cutting oils.
- ***Barber and beauty shops.*** Include perm solutions, dyes, and miscellaneous chemicals contained in hair dyes.
- ***Car washes.*** Include soaps, detergents, waxes, and miscellaneous chemicals. Detergents used in car washing can be a source of phosphorus.

- **Gasoline service stations.** Can be sources of petroleum hydrocarbons if wastewater is not properly disposed. Improper disposal of used motor oil and antifreeze can lead to serious contamination of the watershed and Colorado Lagoon. Potential sources of contamination from gasoline service stations include oils, solvents, and miscellaneous wastes.
- **Golf courses.** Apply large amounts of fertilizers, herbicides, and pesticides in order to maintain a thick mat of short grass on greens and tees, with levels sometimes approaching or exceeding the amount used in agriculture.
- **Hardware/lumber stores.** Include hazardous chemical products in inventories, heating oil and forklift fuel from storage tanks, wood staining and treating products such as creosote.
- **Horticultural practices, garden nurseries, and florists.** Include herbicides, insecticides, fungicides, and other pesticides.
- **Laundromats and dry cleaners.** Include solvents (perchloroethylene, petroleum solvents, Freon), and spotting chemicals (trichloroethene, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate), detergents, bleaches, and fabric dyes.
- **Medical institutions.** Include x-ray developers and fixers (may contain reclaimable silver, glutaldehyde, hydroquinone, phenedone, potassium bromide, sodium sulfide, sodium carbonate, thiosulfates, and potassium alum), infectious wastes, radiological wastes, biological wastes, disinfectants, asbestos, beryllium, dental acids, and miscellaneous chemicals.
- **Print shops and publishing operations.** Include solvents, inks, dyes, oils, and photographic chemicals.
- **Veterinary services.** Include solvents, infectious materials, vaccines, drugs, disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade, bleach) and x-ray developers and fixers.

**Municipal Sources.** Potential sources of contamination from municipal sources in the Watershed include the following categories:

- **Schools and government offices and grounds.** Including the use of solvents; pesticides; acids; alkalis; waste oils; machinery/vehicle servicing wastes; gasoline and heating oil from storage tanks; and general building wastes similar to household wastes. Map 3 shows the distribution of office buildings, institutional buildings and schools and government offices.
- **Park lands.** Including the use of fertilizers, herbicides and insecticides.
- **Public and residential areas.** Can be infested with mosquitoes, gypsy moths, ticks, ants and other pests which includes the use of pesticides. Fecal coliform and urine can runoff residential properties from pets.
- **Streets and road maintenance.** Include the use of herbicides in rights-of-ways, and automotive wastes. Sources of contamination in road drainage include wet and dry deposition, soil erosion, street dirt and litter, and animal waste. Rainwater falling on paved surfaces may become contaminated with nutrients, metals, oils and grease, salts and volatile organic compounds that have accumulated there. Numerous studies have shown that metal (lead, copper, cadmium) loadings from paved surfaces are significant contamination sources.



- **Storm water drains and basins.** Including urban runoff, gasoline, oil, other petroleum products, and microbiological contaminants. Presently stormwater is not treated in the watershed and can end up in the Colorado Lagoon after long periods of accumulation during long dry weather periods.
- **Recycling/Waste containers.** Including residential and commercial solid waste residues. Improper storage and waste handling can contribute to contamination of the watershed. This is especially true at food establishments.

**Residential Sources.** Residential potential sources of contamination include the following categories:

- **Common household maintenance and hobbies.** Including the use of common household products, wall and furniture treatments, and mechanical repair and other maintenance products (see Table 2, Potentially Harmful Components of Common Household Products)
- **Lawn care and grounds management.** Including application of fertilizers, herbicides, and pesticides also occur in residential areas, as well as public parks, and golf courses, posing threats to natural water resources from grounds upkeep. An estimated 50 to 80 percent of homeowners apply some type of pesticides to their lawns, oftentimes with little regard for moderation.
- **Swimming pools.** Including swimming pool maintenance chemicals which can contain free and combined chlorine; bromine; iodine; mercury-based, copper-based, and quaternary algicides; cyanuric acid; calcium or sodium hypochlorite; muriatic acid; and sodium carbonate.

## WATERSHED FINDINGS

### Overview

The Colorado Lagoon watershed water quality conditions are generally very good, upstream of the lagoon. The watershed is predominately residential single and multi-family dwellings. There are concentrations of commercial activities located along the major roadways that include gas stations, car washes, auto repair, cleaners, golf courses, and garden centers/florists. Overall the potential for contamination from these activities is minor. There are some activities that need further best management practices developed and/or enforced to reduce the potential for contamination of the Colorado Lagoon. These, in order of priority, are as follows:

- **Construction Activities.** Construction activities in the area occur on previously developed and/or abandoned properties. During field investigations it was determined that protective sediment reduction BMPs were not used. The City should work closely with Code Enforcement and/or Building Department to ensure that required BMPs are in place and implemented.
- **Commercial Parking Area Wash Down.** During field investigation, washing down parking areas with pressure hoses was observed. Educational material should be developed and provided to those businesses observed performing this practice.

- **Over-Watering.** Much of the dry weather runoff observed during field investigations comes from lawn watering of residences, commercial establishments, public facilities, and golf courses. Educational material should be provided to residents and commercial establishments that identifies the need to prevent over-watering that leads to runoff from individual properties. The golf course should manage their watering activities throughout the evening in shorter, more often stages. This will prevent the large amount of runoff generated by this activity.
- **Pesticide/Herbicide Use.** The golf course applies approximately 62 tons of pesticides and herbicides annually. After application residual amounts are carried off property through storm drain inlets during evening watering. A pesticide/herbicide management plan should be developed by the golf course to reduce the potential of contaminating the Colorado Lagoon.
- **Pathogens.** Residential pet owners are a source of coliform contamination in the Colorado Lagoon. Mailers can be included with monthly water bills that encourage residents to pick up after their pets to reduce the impacts to the lagoon. There is also a dog park within Recreation Park that is used by the public and provides waste containers for dog waste. Though these containers provide protection from coming in contact with rain events, the park itself does not provide protection from runoff of contaminated soil. A simple berm system should be evaluated for placement around the dog park to prevent contaminated runoff from reaching the Colorado Lagoon.

The potential for contamination by each of the categories listed above to the Colorado Lagoon can be mitigated through public education and source control. The potential for heavy concentrations of pollutant discharge was not evident in the watershed. End of pipe treatment systems such as continuous deflection/oil/water separation units to remove sediments and hydrocarbons, or dry weather diversion does not at this time appear practical based on available information and field investigations. Further specific studies may need to be performed to determine specific hot areas that may benefit from locally placed treatment alternatives.

## Data Needs

There are data gaps that limit our ability to draw conclusions regarding the status of the lagoon and its watershed. These data gaps exist for both the lagoon and the tributary sub-basins. The listing does not reflect an assessment of priorities.

**Sub-basins.** Baseline characterization of sub-basins water quality and contaminant loading to the lagoon was not available and not a part of this characterization. Chemical profiles provide important insights regarding quality of waters draining the individual sub-basins and total external loading to the lagoon. It is therefore recommended that a synoptic survey be conducted over at least one full year for sub-basins A, B, and E.

- Monitored parameters should include: metals, oil & grease, calcium, sodium, chloride, magnesium, potassium, sulfate and total alkalinity, total suspended solids, phosphorus, pesticides/herbicides and metabolites, and nitrate N. The sampling program should be conducted for at least one full year, with concentrated sampling during high flow events. Many of the parameters can exhibit strong seasonal



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concentrations that reflect chemical processes, human activities on the landscape, and the rainfall events.

- Sampling during high flows will greatly reduce the standard error of estimates of annual loading.
- Flow monitoring in areas that have the greatest potential for contamination should be performed to determine actual loading to the lagoon.
- The potential for pesticides/herbicides to be adsorbed to sediment particles and transported to the lagoon has not been fully assessed. Further testing should be performed to determine if the golf course pesticide/herbicide plan is meeting its objectives.
- The role and status of the quality of groundwater in the watershed.
- Source of non-point source pollutants can be identified through the existing City of Long Beach illicit discharge detection program.

## Watershed Characterization

As stated earlier, the Colorado Lagoon Watershed (Basin 21) water quality conditions are generally very good. There are areas that can be improved to reduce the potential for contamination of the lagoon. Improvements rely mainly on source control and education rather than on specific treatment practices. At this time no end of pipe treatment systems or sedimentation facilities are recommended. Each of the five Sub-basins are characterized below.

The Colorado Lagoon Restoration Feasibility Study will further analyze opportunities for contaminant reduction based on this and other reports developed to support the study.

**Sub-basin A.** Sub-basin A represents the highest concentration of commercial activities within Colorado Lagoon watershed (Basin 21). There are currently three retail gasoline stations, seven automotive repair facilities, one car wash, and various restaurants concentrated mainly along Anaheim Street, Redondo Avenue, and to a lesser degree 10<sup>th</sup> Street.

During field investigation three potential impacts were observed:

1. Construction sediment control is not being adequately implemented within the entire Colorado Lagoon watershed. At a minimum, sandbags should be required to reduce the potential for sediment transport to the storm drainage system. The following pictures were taken at construction sites within the watershed.

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The following pictures demonstrate the benefit of utilizing sandbag BMP.



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- Commercial impervious surface washing can transport sediments, hydrocarbons, and surfactants to the storm drainage system. This activity is specifically prohibited in NPDES Order No. 99-060 Section D. 1.g. "Prohibit washing impervious surfaces in industrial/commercial areas which results in a discharge of runoff to the MS4, unless specifically required by State or local health and safety codes." The following pictures were taken along Anaheim Street and indicate a normal practice occurring at the location.





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3. Litter and other solid matter is making its way into the storm drainage system. Not only does the litter make its way to the Colorado Lagoon, but it can build up in the storm sewer and restrict necessary flow velocities for proper scour of the pipelines. It is recommended that curb inlet screens be evaluated for placement in commercial areas where litter is present. Increased street sweeping in these areas will remove the litter buildup on the screens. Below are typical inlets observed during field inspection.



**Sub-basin B.** Sub-basin B encompasses the majority of open space within the Colorado Lagoon watershed. The other land use includes residential single and multi-family dwellings. Oil well production is the only industrial activity located in the Colorado Lagoon watershed and is located in this sub-basin. During field inspections proper BMPs were in place and the potential for discharge was minimal. The maintenance facility for the golf course maintains an above ground gasoline storage tank that is fully contained for maintenance vehicles, a SWPPP is on file with the City of Long Beach. A picture of the oil production wells is presented below.



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During field investigation three potential impacts were observed:

1. Pesticide and herbicide use on the golf courses and parks may impact biotic life forms residing in the Colorado Lagoon. Approximately 62 tons of pesticides, herbicides, and fertilizers were used at the 18 hole and 9 hole golf courses in Sub-basin B. A Pesticide/Herbicide Management Plan should be developed and implemented by the golf courses to mitigate contamination of the Lagoon to the best extent practicable.
2. Fairway and greens watering occurs at the golf course in the evenings. The topography of the golf course is such that runoff travels from most areas to the center of the courses in to drop inlets, as shown below, and carried by the storm drainage system directly to the Lagoon. Watering practices should be recommended that encourage staggered watering in lesser amounts to prevent runoff that can transport the pesticides/herbicides/fertilizers to the Lagoon. Diversion structures can be placed around the inlets to redirect flow from entering the storm drainage system, or covering the inlets before watering occurs. Inlet covers can be removed during normal play or when rain is expected.



3. The dog park located at Recreation Park does not prevent sediment contaminated with coliform or urea from exiting. This sediment can transport pathogens into the Colorado Lagoon and increase the potential for beach closings. A simple berm structure can be placed around the perimeter to prevent wash out of sediment during storm events. The picture below indicates containers for placement of waste, but also shows the potential for potentially contaminated sediment discharge.



**Sub-basin C.** Sub-basin C is entirely residential and surrounds the eastern portion of the Lagoon. No immediate impacts were observed during field inspection. Other previous recommendations should apply to this sub-basin as necessary to mitigate construction activities and litter accumulation when observed.

**Sub-basin D.** Sub-basin D is entirely residential and is adjacent to the southern portion of the Lagoon. No immediate impacts were observed during field inspection. Other previous recommendations should apply to this sub-basin as necessary to mitigate construction activities and litter accumulation when observed.

**Sub-Basin E.** Sub-Basin E maintains a high concentration of commercial activities, with respect to the entire watershed. There are currently four retail gasoline stations, three automotive repair facilities, one car wash, and various restaurants concentrated mainly along 7th Street, Redondo Avenue, and to a lesser degree 4<sup>th</sup> Street. The potential impacts identified in Sub-basin A also apply here. Mitigation opportunities established above in Sub-basin A should be applied here as applicable.

This report was developed to support the Colorado Lagoon Restoration Feasibility Study and should not be utilized on its own for any planning alternatives.

## **REFERENCE LIST**

Los Angeles County Hydrology/Sedimentation Manual, 1991

City of Long Beach Storm Water Management Program Manual, Revised – 2001

City of Long Beach Local Coastal Program, 1980

Mitigated Negative Declaration – Termino Avenue Drain Project, 2001

California Water Quality Control Board, Los Angeles Region Order No. 99-060, 1999